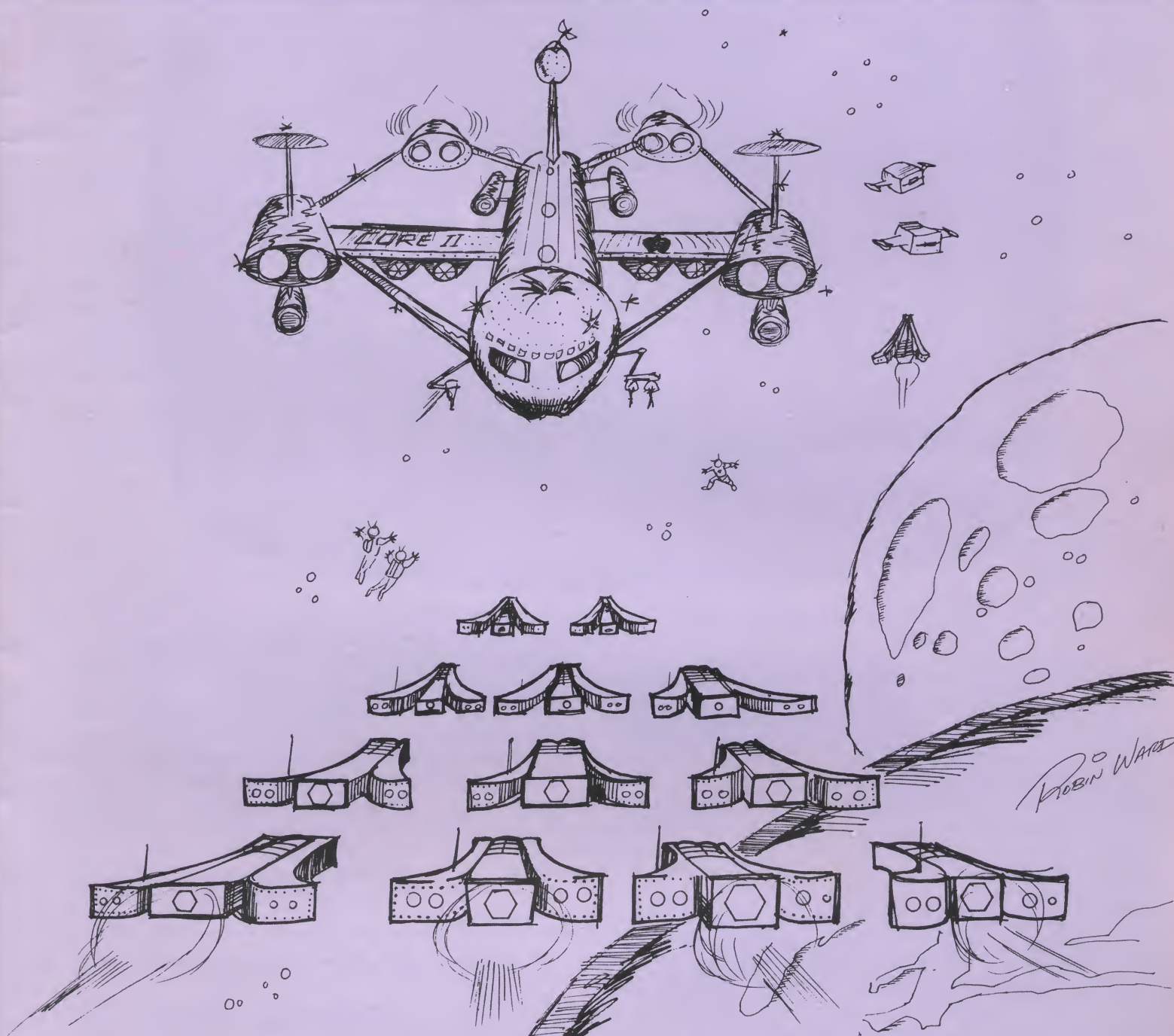


April, 1982
NEWSLETTER

\$2⁰⁰
Vol. 2, No. 4

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EDITORIAL

by Marshall Dubin

Finally some time to write an editorial! Not much time though since this is now Wednesday night and our printer is pacing the floor waiting for the copy which is due tomorrow. Oh well...(yawn) I can always get some sleep on Monday.

BILL OF FARE

Welcome to our MICRO WARS issue! This month we bring you an exciting tale of heroism and determination against the ever present danger of the evil ENERGY CZAR. Also Bob MacDowell once again takes up the gauntlet in yet another Apple-eye view from his side of the fence. Sheldon Leemon leads us through the cryptic world of the CIO, and our Baker Street detective investigates the variable name table.

Also this month, we have 6502 wizard Marcus Watts on Atari Graphics, some peeks at the character set with Eric Sobicinski, and two excellent games for kids (of ANY age) from Jerry Aamodt.

Several months back I wrote an article for MACE on interfacing the Atari PIA to monitor "real world" switches, temperatures, alarms, etc. Well the 'part 2' I promised the very next month never did get published. (as Richard Gizynski reminds me monthly)...so I have again included part one of "Interfacing" and I PROMISE that part two (output to relays, etc.) will follow in May.

PARTY TIME

Everyone is getting excited about our big MACE birthday party at the May meeting. We are expecting a few Atari VIP's, and there will be lots of fun and games for everyone. Don't forget to bring your membership card because you'll need it to get in. Memberships will be available at the meeting however, so if you don't already belong you can join up then.

MACE BBS

If you haven't tried the MACE BBS system yet, believe me you don't know what you're missing. Now that the new equipment is here we are on line 24 hours a day. If you have a modem, give us a call at 868-2064.

I hope everyone is pleased with our new expanded magazine format. Many thanks to our MACE business support group, headed by VP Jerry Aamodt for bringing us the needed funding to make this venture possible. Also much appreciated are the excellent contributions of Production Editor Richard Gizynski, Printing Consultant Fred Parr Jr., and of course our writers, contributors, and advertisers. Also special thanks to artists Robin Ward (front cover) and Stephan Inda. I believe we have page for page, one of the most comprehensive ATARI resource publications available!

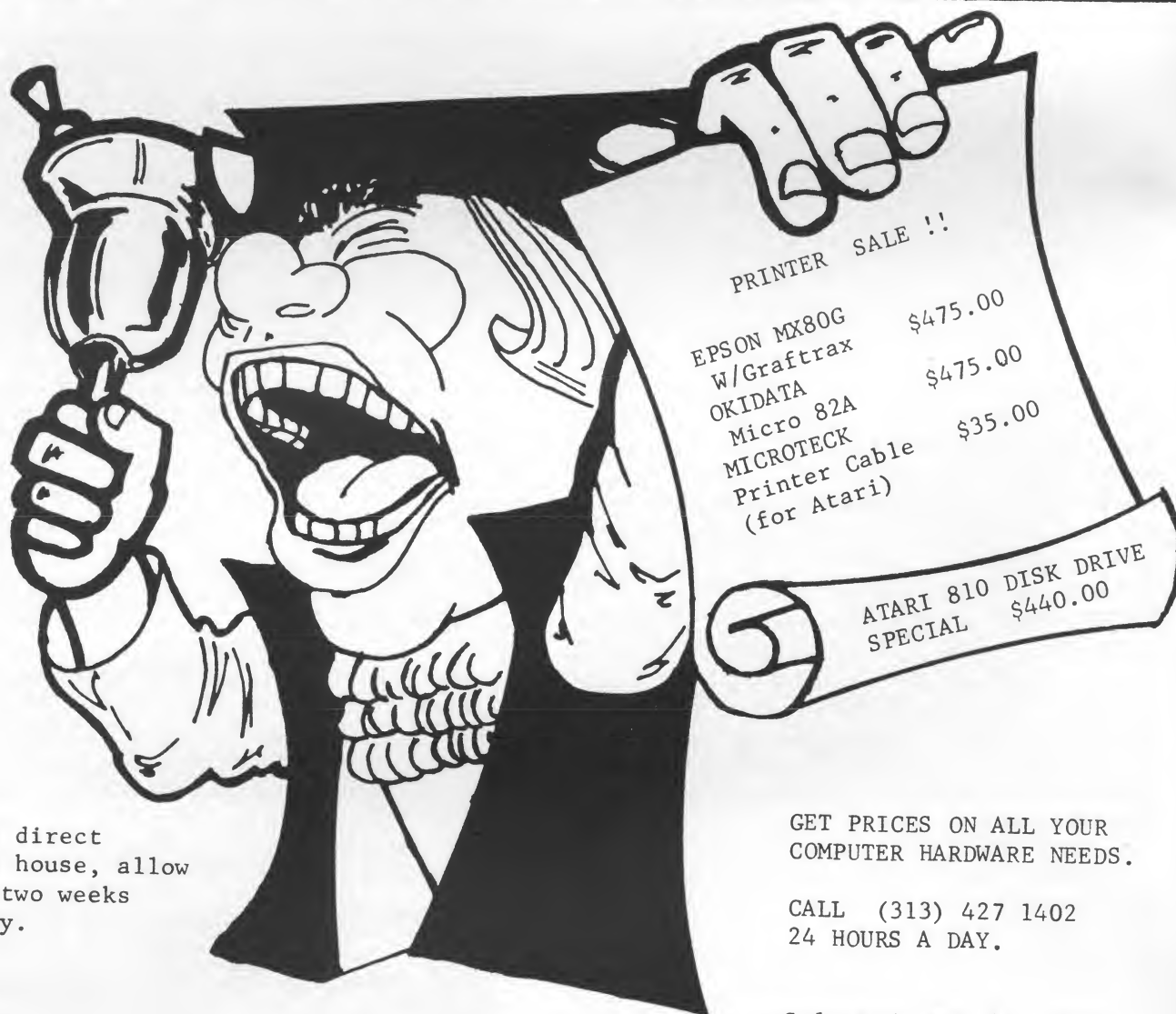
Well, so much for my two cents worth. In all sincerity I hope that you are finding this publication both useful and informative. As always I welcome your comments and suggestions. Now, settle down by the fire and try to read your way through the final throes of this terrible Michigan winter. Happy
c o m p u t i n g !



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MARCH MEETING MINUTES

Sheldon Leemon, Secretary

MUCHO MEMBERS AT MARCH MACE MEETING...At 360 paid members, MACE has got to be the biggest Atari users' group in the known universe. Anybody out there in Tau Ceti care to challenge our claim?

MACE IS THE PLACE with the helpful hardware men. Leading off the meeting were Gary Luzier, Don Goldsmith, and Silent Ed Schultz fielding questions from the floor (and the audience, too) about hardware. Frankly, I thought it was a lot of fuss to make about a bunch of silly wrenches and stuff. I mean, guys, this is a computer club. Am I right?

TAKING CARE OF BUSINESS mostly meant passing a resolution to buy an 825 printer for the newsletter by a vote of 289 to 1. The solo Nyet came from yours truly. I hate the 825. I tried to print the documentation for INSTEDIT (available directly from APX for the ridiculously low price of \$17.95, a real steal for the best character graphics utility available, with features not found on character generators at twice the price) several times, and each time it ate the paper halfway through. But the herd instinct beat out common sense to the tune of 450 shinplasters. Who would have thought that a group that was intelligent enough to buy so many copies of INSTEDIT (ask for it by name!) would make such a mistake? Good luck, Marshall. Just don't blame me if half the print is unintelixrbghplqeidyth!

LET THE GAMES BEGIN....said the participants in our main program for the evening (which was pretty gamey). Big arcade stars such as Ed (Lucky) Middlebrook, Dirk Hoag, and Tony Weber let us share their secrets of success in Star Raiders, Missile Command, and Galactic Chase. And what did these household words say was the road to stardom? Ed said use the least amount of energy possible in Star Raiders, don't use your engines at all, fire few shots, keep the Zylons below your crosshairs, and use a lot of short jumps to sector-shop your opponents. Dirk said that the rule he follows in Missile

Command to rack up a million or so points is DONT PANIC. Of course, it doesn't hurt to have the relexes of a ten year old. I mean, do those kids REALLY score all those points, or do they just get confused by all the zeroes? Tony Weber's secret of success with Galactic Chase is no secret—he wrote it. Obviously, the only way to test his assertion of a bonus base after the 40th screen is to play it until they have to pry the joystick out of your cold, dead hand. Rotsa Ruck. But I really love those games, you know. I mean, isn't that what its all about? People and machines, learning to live together in harmony, and blast a lot of aliens? You figure it out. I was just glad to find out that you could skip a cavern in Caverns of Mars by hitting the TAB, SHIFT, and CONTROL keys together. If it wasn't for that tip courtesy of Jim Murphy of the Panama Canal Users Group, I wouldn't have gotten to Cavern 4 until the Second Quarter of 1983 (Atari translation--never).

The meeting adjourned at 9:57, right on time, but I still missed the first half of Hill Street Blues. And no, Arlan, I didn't tape it. Sheesh.

Ⓜ

CORRESPONDENCE

Dear MACE,

I played ASTEROIDS for a very long time, non stop about three months ago. I had 200,000 points and it was time for dinner. I pressed the SPACE BAR to stall the game and when I came back 10 minutes later the game was locked up! I was determined to beat 200,000 but I couldn't do it. Finally on February 18 I broke my high and got 400,000 on FLIP. My friend Darren Findling got 800,000, but that was on SHIELDS. But really we did the same because in SHIELDS you get less points. I would really be interested in getting a TEAM DOUBLES contest together.

Eric Chodun

Any Takers?(ed.)

GAMBITS

by Arlan Levitan

My biased rating scheme:

**** - Outstanding
 *** - Pretty Good
 ** - Mildly Interesting
 * - Marginally Defensible
 No stars - Without Redeeming
 Social Importance

APPLE PANIC - Broderbund Software ***

One of the largest independent software houses leaps into the Atari market with a faithful translation of one its best sellers. Panic is particularly satisfying for Atari owners, the object of the game being to trap Apples that chase you by digging holes in multi-tiered brick floors and then beating them into applesauce with your shovel before they crawl out and get you. For a complete rundown of the game see Greg Williams two page review in the March issue of BYTE magazine. One disconcerting bug: Occasionally no sound when you dig. Even though it contains some irritating flaws, Apple Panic is addictive, entertaining, and well thought out.

PRINCE OF SUNNYVALE - Silicon Valley Simulations ****

An educational trip into the politics and realities of success and failure in the land of Chips and Dip switches. You start as an assistant Vice President in charge of inserting erroneous information in user manuals. Rack up more points than your opponents by announcing products two years before release. Earn a big bonus if you can get away with not delivering the product at all. Score big with your dealer network by shorting field service locations on parts and reorganize every three months just to keep things interesting. Great fun for the whole family!

RASTER BLASTER - BudgeCo ***

Multiple player video pinball for the Atari. A slick, enjoyable pinball simulation with nice graphics, good ball motion, and great playability. If you're not into pinball you may not enjoy this. If you are, you will end up wishing you could tilt the blasted playfield at times. I would have preferred to use paddle

rather than joystick buttons for the flippers, and wish that a greater variety of sounds had been utilized.

SOFTWARE PIRATE ADVENTURE - CIO Software ***

Join B.B. Roberts and a swarthy crew of fourteen year olds in the quest for the missing sector while evading the dogged pursuit of the mysterious EROM monster. Note! The purchaser of this game must present a notarized affidavit guaranteeing that the end user does not own or has ever used a video tape deck, audio cassette recorder, or Xerox machine.

ANDROMEDA - Gebelli Software

You say you've just started programming in machine language and have worked out a demo using fine scrolling and a redefined character set? Wow! Why don't you add some irritating sound, a player, and some crude shapes flying around? Voila! A forty dollar diversion! My nomination for the dumbest game of the year. If you get it as a present you can always format the disk so it can hold something useful. I did.

ANALOST - Hot Wind Productions *

Play big time computer magazine publisher as you learn the fine points of operating within the free enterprise system. Collect startup capital from subscribers by promising six issues a year and then publish when you feel like it. Review games before they've been written. Better yet, distribute your own mediocre software and give it glowing reviews in your mag. How about selling hardware on the side and telling your advertisers they can't print hardware prices. Then lose what little credibility you have left by publishing righteous editorials complaining about the "unethical" behavior of user groups.

BISHOP'S SQUARE - Datasoft **

Square is software designed to take pictures created by the soon to be released Micro Painter package for the Atari and scramble them into computerized jigsaw puzzles. Your job is to move the pieces around to get back to the original screen. Three nicely done pictures are provided on the disk. Selectable degrees of difficulty create puzzles with from four to sixty-four pieces. Partially solved puzzles may be saved to disk. Also included is a pleasant non-competitive game called Maxwells Demon.

SPACE CADETS - Glen Corbett Inc. *****

Rumored to be the original multi-player version of Star Raiders smuggled out of Paul Cabbage's raquetball locker. Requires a minimum of fifty-three players with joysticks wired in parallel, 2 megabyte hard disk, fourteen projection screen televisions, and flight clearance from NASA.

CROSSFIRE - On-line Systems ***

A very difficult, well executed, hard on the eyes, nerve-wracking, noisy arcade shoot-em-up requiring the motor reflexes of a hyperkinetic axe juggler. Kids will love it. Guaranteed to turn one joystick into mush every two hours of play.

QUEST FOR BUCKS - Cryppleware

The newest release from John and Patty Bull! Includes ten full page ads, Crypple Vision magazine, autographed holograms of John and Patty, a certificate entitling the bearer to an almost free screen test for a never to be released movie, one gratis threatening phone call from John, and absolutely no software. At last we have a package from Crypple with no bugs! More fun than a bucket of mud! ☺

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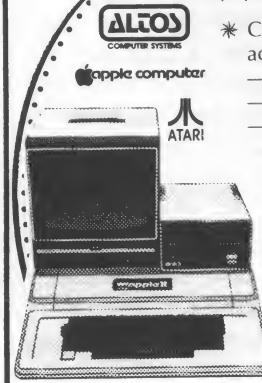
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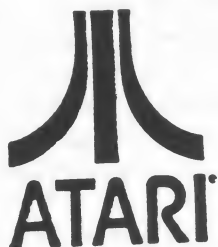
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DOWN MEMORY LANE

by Sheldon Leemon

Today's excursion includes a trip to the dump--the Screen Dump, that is. But watch out for the garbage. There's been a lot of garbage written about dumping your screen to disk in users' group newsletters, and Compute even devoted a couple of pages to a BASIC version, using a loop of PUTs and GETs. That approach will work, if you like to wait. But why just sit on your OS when you can use its full power to transfer data at the maximum possible speed? Anybody can read a Graphics Mode 8 screen in from the disk in less than five seconds, using a line or two of POKes, and seven bytes of machine code.

There is no magic involved. Its accomplished through the use of the Central I/O Utility routine which is part of the Operating System ROM. I know that this is getting dangerously close to crossing the border into the dreaded land of Machine Language, but for the faint hearted who want to stop now and turn back, let me assure you that I'll keep it simple, and even if you don't understand everything, you will still be able to use the routines provided to save and restore your favorite screen images painlessly. If you want, we can even pretend that this is a story about a magic genie called CIO.

CIO is the genie who handles all I/O operations on the Atari, so he's a pretty handy guy to know. Normally, Atari BASIC gives him his orders, so you don't have to bother. But he has very special powers that Atari BASIC does not support (although BASIC A+ does). These are the PUT CHARACTERS and GET CHARACTERS Commands. These commands allow you to transfer any number to bytes at maximum speed to or from any location in memory. This is handy for many applications, including saving screen data. So, on with the CIO.

In your wanderings, you may have come across the term IOCB (short for I/O Control Block). These are just 8 sets of P.O. boxes, where CIO gets his mail. Each IOCB contains 16 bytes, or compartments. These boxes have

a quaint set of names, such as ICHID and ICDNO. But only a few of these boxes are important here. They are ICCOM (command number), ICBAL and ICBAH (low and high bytes of the buffer address), and ICBLI and ICBLH (number of bytes to transfer). All you have to do is to fill these boxes and then go to CIO via a short USR statement. CIO will check the boxes, and do what is ordered there.

What we need to know is where the boxes are, and what to put in them. First comes ICCOM. The command byte for IOCB #1 is in decimal location 850. Since each IOCB is 16 bytes long, ICCOM for IOCB 2 is at 866, for IOCB 3, 882, etc. If you want to PUT CHARACTERS, the command number is 11. The GET CHARACTERS command is 7.

ICBAH and ICBAL are located at ICCOM+2 and ICCOM+3. This means, for example, that for IOCB #1, ICBAL is at 852, and ICBAH is at 853. These two bytes hold the address where CIO starts sending data to or from memory. Two bytes are needed, because each can only hold a value up to 255. For numbers larger than that, the second byte (ICBAH) hold the number of 256's. To put it another way, if BA is your buffer address, ICBAH=INT(BA/256), and ICBAL=BA-(256*ICBAH).

Finally, ICBLI and ICBLH contain the number of bytes to be sent. These are located at ICCOM+6 and ICCOM+7, so that for IOCB #1 they are at 856 and 857. If on a read, the files contain less than the number of bytes specified, the actual number of bytes read will be placed into these locations.

Now we get to the actual screen dump. First, we have got to OPEN an IOCB for a write. Let's use #1:

```
1000 OPEN #1,8,0,"D:SCREEN.DAT"
```

Next, let's save the graphics mode number, and color registers.

```
1010 PUT #1,PEEK(939): FOR I=0
    TO 3: PUT #1,PEEK(708+I): NEXT I
```

Notice that we get the graphics mode number from one of the bytes in IOCB #6, which is used for screen I/O. Next, we figure the starting address for the transfer. From my numerous previous articles, we know that that the pointer to screen data is at 88 and 89. But why not save the data from the display list up? That way, the routine will work even for screens where the display list has

continued

been altered. So all we have to do is transfer the contents of 560 and 561 to ICBAL and ICBALH. But how many bytes are there? One easy way to find out is to calculate the address of the display list, and subtract that from the top of memory:

```
1020 RAMTOP=PEEK(106)*256: DL=
PEEK(560) + PEEK(561): BYTES=
RAMTOP-DL: HI=INT(BYTES/256):
LO=BYTES-(HI*256)
```

Now we are ready to set up the IOCB:

```
1030 POKE 850,11:POKE 852,PEEK(560):
POKE 853,PEEK(561): POKE 856,LO:
POKE 857, HI
```

All that is left is the machine code routine to set the X register (that tells CIO what IOCB to look at) and JUMP to CIOV (where CIO lives):

```
1040 X=USR(ADR("hhh*LVd"),16):
CLOSE #1: REM The * and d must
be inverse video
```

To read the screen back is even easier:

```
2000 OPEN #1,4,0,"D:SCREEN.DAT"
```

```
2010 GET #1,A: GRAPHICS A: FOR I=
708 TO 712:GET #1,A:PUT I,A:NEXT I
```

```
2020 POKE 850,7:POKE 852,PEEK(560):
POKE 853,PEEK(561):POKE 856,255:
POKE 857,255
```

```
2030 X=USR(ADR("hh*LVd"),16):
CLOSE #1: REMember to invert * & d
```

You might have noticed that we specify 65535 as the number of bytes to read. The read will therefore proceed until the end of the file.

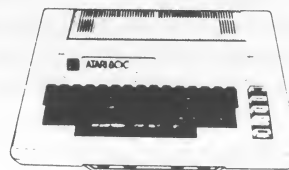
You lucky people with BASIC A+ can get accomplish the same thing with a whole lot less code. In the screen save program, you can forget the last three lines, and substitute this one:

```
1020 dl=dpeek(560): bytes=peek(106)
*256-dl:bput #1,dl,bytes:close #1
```

No PEEKs or POKEs to move the data! I think these guys are trying to put me out of

business. Reading in the screen is just as easy. Replace the last 2 lines of the screen read program with a new line 2020, that is the same as 1020 above, only replacing "bput" with "bget".

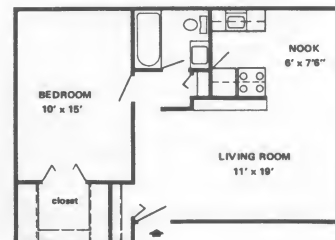
The kinds of things that you can do with a routine like this are endless. You can use this fast read to call in character sets from a data file, to read machine code directly onto page 6 (or wherever), even to store screenfuls of writing (you know how hard it is to put a lot of text on the screen with PRINT statements without running into the margins). And of course, the screen dump function will let you save images from your favorite drawing programs, the ones in BASIC that take forever to draw a complicated pattern in Graphics 8, and display them in a matter of seconds.



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MICRO WARS!

by

Arlan (gee is it deadline already?) Levitan

Luke Crawford squinted past the triple suns of Dos II at the fiery trail of what seemed to be a meteorite. A high pitched whine pierced the thin air as the object thundered beyond the stark red horizon.

"Might as well investigate", Luke muttered to himself. Besides, anything would be a welcome interruption to his duties as Energy Czar of the tiny, one reactor planet. Crawford climbed into the snug cockpit of his private Match Racer, thumbed the voice recognition unit on, and said "Scram". The custom made flitter leaped skyward. "Sector 720 -locate, track, and make contact."

Within minutes he was circling a crater of smoldering debris. "Looks like an escape capsule didn't", Luke thought. It seemed highly unlikely that anything could have survived the impact. "The braking retros must have failed. But wait..." silvery movement caught his eye at the edge of the black pit. "Soft landing - warm shutdown...In that order please." The tiny craft dutifully responded.

In a few moments he was facing the oddest pair of androids he had ever seen. One was technically elegant with a surface of wildly shifting colors. The other was quite dumpy, a virtual hodgepodge of scrap parts. The tall multicolored droid spoke. "Excuse me sir, my name is GTIA and this is my friend D1:D2. Can you help us find the humanoid known as Obie Lon Bushnell. We have an urgent message for him from the Wizard and the Princess and..."

"You mean old Nolan Bushnell? The guy who runs the pizza parlor in town? Hop in the flitter fellahs. We'll be there in a nanosecond."

D1:D2 could hardly contain himself. The droid made some weird buzzing noises as it seated itself in the flitter's jump vector seat and squeaked "144,144,170,163!" A few instruction cycles later the trio found itself seated at a table in the darkened corner of DOS II's only interplanetary fast food joint. Weird rodent-like life forms scurried about as

the ascetic owner of the tavern seated himself. "Odd company you're keeping these days Luke...wait a minute...isn't that one of the Princess's droids?"

"I most certainly am sir! And D1 here is also! Please aid the Princess," GTIA pleaded as he flipped a switch on the short droid's surface, "she's being held against her will!"

A holographic projection of a demure, but obviously strong willed young programmeress filled the air. "Help us Obie Lon Bushnell! The Apple Empire is holding me and the rest of the Consumerites captive deep within the bowels of their Motherboard." A shudder of revulsion racked her frail body. "I don't know what I'll do if Darth Wozniak forces his crude editor on me one more time! Please help..." The vision faded.

Bushnell's head sank into his hands. "This is all my fault! I should have known that Wozniak would fall prey to the dark side of the Sales Force. I'm too old to survive a hyperspace jump now...but YOU can Luke!"

"You're out of your logic tree, Nolan! What are you talking about?"

"Luke, listen to me. Long before I came to Dos, I worked and trained with both Darth Wozniak and your father..."

"You knew my Father!? But how!?"

"We were all Star Raiders for Atari. We tried to bring computing to the people, but they were not ready for us. Disgruntled, Darth left us and joined the evil side of the Sales Force. I think it's time to give you this!"

His eyes filled with wonder and awe, Luke accepted the tan tube proffered by Bushnell and ran his hands over its glistening surface. "A Display List Interrupter! I thought these didn't exist!"

"It was your father's Luke. Several were assembled before the technique became a closely guarded secret. Use it Luke! Stop the lies of Wozniak and the Imperial Dealerites. Rescue Princess Public before it's too late! I believe you'll find a Pilot with a ship for hire by the attack simulator along the far wall."

Luke carefully approached the figure hunched over the console Bushnell had indicated and tapped gently on a granite-hard shoulder. In a blur of motion he found himself looking down the barrel of a Mark IV raster blaster. "Uh...I..I heard you have a ship for hire....", Crawford managed to stutter.

continued

"Well why didn't ya say so before you got familiar, kid?" A smile slowly spread over the weather beaten face. "Lefty Kartz is the name...this is my partner Choontabacca," he said, indicated a swarthy looking Antares snapping turtle hovering over his shoulder. "Star Cruiser Seven is always available for a price...what kind of job did you have in mind?"

"Oh, a suicidal attack on the Apple Empire's Motherboard for starts."

"Forget it kid! I'd rather not drive to my own funeral. There's not enough poscreds in this sector of the Galactic Map to make me even think about it...I'd just as soon bunk with a Leemonian slime beast or... what have you got there on that piece of non-conductive foam?"

Luke smiled serenely. "Just a couple of Revision B OS chips."

"Like I said...how can I refuse when the well being of the cosmos is at stake? What are we standing here wasting time for?"

The take off from Starbase 12 was singularly uneventful. Even Luke's usual queasiness as he punched the H key on the X Wing's command console was been left far behind as the stars blurred past.

"Red Alert boys and girls", Kartz whistled through his teeth as they jumped back into normal space almost on top of the twisting metallic valleys of the Apple Motherboard. I'm going to take her down along the data bus and hug the substrate! Luke, man the photon banks and watch for the central processor!"


Steely determination gripped Lukes mind as he concentrated on the battle computer. His stomach turned end over end as Kartz threw the tiny ship into maneuvers that frustrated the pursuing patrols of Tie Fighters. A slow, burning rage filled his entire being as he sensed the final approach to the seat of the Empire's power. Now he would have his revenge for the lies, the half truths, the ignorance and foul deeds of Wozniak and his Dealerite accomplices! Now high technology and superior design would be recognized and extolled! The central processor loomed in his sights. Now, he thought! His finger moved toward the switch that would deal the death blow so richly deserved.

Suddenly the face of his father's revered

teacher Yoga glimmered brightly before him. "Use your Force for good" It whispered. "Do not let your hate cloud your mind, Star Raider...open your eyes and see things for what they are..."

Luke stared at the target filling his viewscreen. A look of shock, then recognition came to his eyes. "Pull up Kartz! Pull up NOW! Get us out of here!" The G force of the violent turn hurled luke against a bulkhead. Darkness closed in upon him...

He awoke to be confronted by an angry Kartz. "We're safe for the moment bright boy. Hiding out in an asteroid belt. Are you out of your mind kid? You had 'em dead as a stuffed Hyperion duck. Why didn't you fire?"

"I saw the truth Lefty. Do you know what we were going to blast? A 6502A! I would have blown away a blood relative. Yoga is right. There's no point to this crazy war at all. Hand me the sub-space radio and get Wozniak and his people on the line. It's time to stop screaming at and start talking to one another. I expect we both have a lot to learn." 



Stephan Inda



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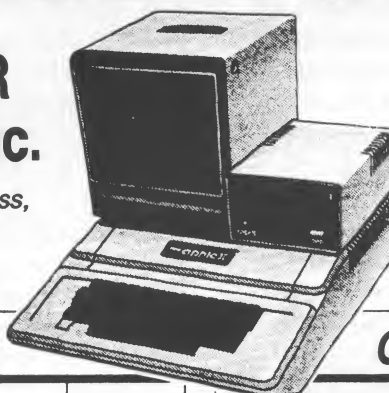
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THE OTHER SIDE OF THE FENCE

by Bob MacDowell

War and Peace

Welcome to what I hope will become a regular column in the MACE newsletter. I call it "The Other Side of the Fence" because, of all things, a fruit. You see, there are the Atari owners, and there are Apple owners. And betwixt them there is a fence of hardware and software incompatibility, and even social snobbery. Well, I own an Apple II, which puts me on The Other Side of the Fence. I program the Atari 800 professionally for a company in Troy called K-Byte. You may have heard of us; we make K-razy Shootout.

The topic for this month is War and Peace. It's about why Apple and Atari owners, at least the more fanatical ones, don't like each other, and why they should.

Craig Chamberlain wrote a rather good article about Microsoft Basic in the February newsletter, but I feel he used the last page of the article primarily to cut down the Apple. He showed the time that the Apple and Atari BASICs took to do a benchmark. Apple won by about 2%, so he wrote, "Yes, the APPLE is faster but remember that no benchmark is totally fair." Well, Craig, if benchmarks aren't totally fair, what is? The reason Apple won is because Applesoft is designed for speed, not for power or ease of use. More powerful languages will run slower, because they're more complex. Further down, Craig said that Apples can't turn off DMA. He's right. You see, Apples don't do DMA in the first place, so they can't turn it off. (DMA means stopping the microprocessor to give the video circuitry time to get information from memory. In other words, DMA slows down your processor.) Anyway, the Apple doesn't need DMA to slow it down. It's slow enough already. Craig remarked at the end, "... ATARI is the way to go." I think we'll all agree with him there, at least in terms of what we want to do with a computer.

Have you noticed that no one's compared the Atari to the TRS-80 Color computer? Or

the IBM-PC? Or the Exidy Sorcerer, the TRS-80 Model 3, TRS-80 Model 2, TRS-80 Pocket, Sinclair ZX80, NEC, Xerox, PET, CBM, VIC, TRS-80 Model 16, Osborne 1, VideoBrain, Hewlett-Packard, Apple III, Northstar, Alpha Micro, Altair, Interact, Kim-1, Hitachi, Aim-65, Texas Instruments, Heathkit H-8, H-88, H-89, H-11, and that's off the top of my head. The point is, with all those computers out there, why do Atari owners pick on the Apple, and Apple owners pick on the Atari? Why not determine which of the computers listed above is the greatest waste of silicon and then everybody pick on it? For that matter, why pick on any computer at all?

Perhaps people who buy Apples or Ataris were so unsure about which of the two to get that they must cut down the computer they didn't get just to reassure themselves that they made the right decision. There has always been a lot of haggling between Atari and Apple owners about which computer is better. Apple owners started it. When the Atari 400/800 were first introduced, the Apple community's reaction was WOW! Another T.V. game. They figured who'd waste \$995 on an 8K computer made by a video game company? After all, its graphics COULDN'T be better than the reference standard Apple hi-res graphics. Besides, why trust a company who did not provide technical documentation?

Eventually, Atari did release their documentation. Apple owners were very interested in these manuals, since they had noticed certain phenomena in Star Raiders and Basketball which they couldn't figure out. Unfortunately, the Apple people were having some problems with the terminology. "What's vertical blank? And what are interrupts? What do color registers do? What are these funny things called Players? And Missiles? 1.8 MHz? Not bad. Holy cow, lookitall those graphics modes. Who's ANTIC? Hey, look, Atari's coming out with a new home computer. It's called POKEY. ..."

Apple owners quickly figured out that the Atari was up-and-away the most awesome graphics machine that could be afforded. What everyone failed to realize, in their jealousy or whatever, was that the Atari and the Apple are really quite similar. This involves getting into some history, so here goes.

A long, long time ago, in 1973, there existed the first computer club - the Homebrew Computer Club.

continued

Back then, the way you built a computer was to get an 8080 microprocessor and build a processor board. Then you built - and I mean scratch built, not like Heathkit - a couple of memory boards and an input/output board or two. Plug all these into a common bus, add a teletype terminal and a front panel (to enter programs - ROM didn't exist back then), cross your fingers, and apply power. If nothing blew up, you could throw switches on the front panel so as to program in a bootstrap program which would let you read in an operating system off of a sophisticated storage device like paper tape. Of course, it had to be a small operating system; you only had 1 or 2 k of memory.

Anyway, one member of this computer club was named Steve Wozniak ("the Woz" for short) and he worked for Atari. When he built his computer, he made it very different from everyone else's. He used the brand-new, faster, and more powerful 6502 processor, which he had used at Atari, instead of the 8080. He designed it around new, state-of-the-art 4k dynamic memory chips and left provisions for use of 16k dynamic chips which were supposed to become available in a few years. He left room in his computer for three banks of these memory chips, for a total of 12k, or 48k with the 16k chips. He also tried using ROMs to hold, permanently, not just the operating system, but the BASIC language as well. Woz was not content to use the latest in technology, he had to design his computer as no one had done before. He added sound to his computer. But to top it all off, he added a video display to his computer. His idea was to have the video circuitry use main memory for its display memory. The other members of the computer club were astonished. Video terminals were not unheard of, but video COMPUTERS were. The processor had immediate access to all of the screen memory, and could change any of it with a single instruction. But Wozniak's coup de grace was graphics. Oh, not just ordinary graphics, that would be merely exotic. They were COLOR graphics!!

A colleague of the Woz, Steve Jobs, saw that such a machine could be manufactured and sold to the general public, for a handsome profit! Jobs turned out to be right. Woz's machine was the first personal computer. Now,

if you think Woz's machine was the forerunner of the Atari 800, you're half right. After Atari was sold to Warner Communications in 1976, somebody high up decided to improve on what Wozniak had done and offer it for sale, which Atari did. By the way, Steve Wozniak left Atari before then and joined with Steve Jobs to found Apple Computer.

The Apple was first meant to be a hobbyist's machine. It was designed by a hobbyist, Steve Wozniak, for a hobbyist, Steve Wozniak. So the Apple should be a rather good machine for someone who likes to poke around under the hood with an oscilloscope, or wants to make his own plug-in board for a special purpose. Matter of fact, the Apple is designed for such creativity; that's what the peripheral bus along the back of the motherboard is for.

Apple Computer soon discovered that the hobbyist market was not the most lucrative, and they decided to install a more powerful BASIC language into the Apple II and sell it as the Apple II Plus. Their target was the consumer and business markets. The Apple made a rather nice business computer, when outfitted with an optional 80 column video display and the right software. It was a machine in the personal computer price range that did most of the things small businesses needed.

Atari targeted the 400/800 at the same markets as Apple did. However, the 800 really wasn't very successful as a business computer, despite the nicer keyboard. I/O was too slow, the 800 couldn't have 80 columns until just recently, and didn't have the large quantity of business software available that the Apple II or III, or the TRS-80 Model II had. That's why Atari cancelled the 815 dual disk drive. It was meant for the business market, which never materialized.

Atari attracted a lot of hobbyists (including me) with its incredible graphics, but the consumer market is where the Atari really shines. It's cheaper than a comparable Apple or TRS-80, and it works well for the person who wants to slap in a cartridge and play games, or the person who wants to develop programs or do personal word processing on it, or anyone in between. All the software development and testing at K-Byte is done on Ataris.

What I'm getting at is that they're both good machines and that you can't, or at least shouldn't,

continued

knock either one of them. Realize that if either computer is used for something it's not good at, you'll get a bad impression of it. Picture an Apple trying to perform a rendition of Beethoven's fifth symphony out its little internal speaker. Or someone trying to do voice recognition with an Atari. Or a PET owner attempting color graphics.

Whenever someone calls your Atari a game machine, inform him that he is narrowminded and that he should have more respect for other people's equipment. Don't start into the superiority of Atari graphics, as that will surely start a major argument. When someone insults your equipment, don't insult their equipment. Just say something that will make them feel like a jerk for saying anything against your machine. When you get to the bottom line, there's no real difference between an Apple owner who has a Z-80 softcard and an Atari owner who has 256 colors, as long as their both happy with and use what they've got.

Okay, I'm done with War and Peace. But wait, did I say 256 colors? Yes, I did, but how? Easily, with a GTIA chip. And all on the screen at the same time. 16 colors, 16 luminences. In BASIC, yet. If it'll fit in this month's newsletter, it'll be there, otherwise wait until next month.

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ATARI GRAPHICS

By MARCUS WATTS

These items are intended to be a brief overview of the display and graphics capabilities of the Atari.

The Atari 400/800 comes with four large scale integration chips which comprise the heart of the system. Add some TTL, analog and memory and packaging and you have an Atari.

These chips are:

6502 MPU running at 1.79 clock speed

6520 PIA hooked to joystick lines and serial port control lines

CTIA "Candy/Colleen Television Interface adaptor" This generates the color and timing.

ANTIC "Axxx's New Television Interface Adaptor" This handles DMA including memory refresh, and all graphics DMA.

POKEY "xxx Keyboard controller" — this has many functions, including TV sound generation, Serial bus asynchronous I/O, timing, (interrupts for MPU) and Key Board Scanning.

The last three chips are custom designed by Atari and are only available as part of an Atari. They are designed to only work with the 6502, though they should work with anything that can be made to look like one, this includes Z80s, 8086s, 68000, etc. but excludes the 6800 and 6809, because the 6502 has a "RDY" line intended for slow memories that the 6800 does NOT have — 10 microseconds and your 6800 has amnesia!

The most unusual feature of the Atari is, of course, its graphics, and this part is heavily optimized for writing games. But first, a brief description of the VCS should help in explaining the origins of some of the names.

The VCS has one chip that does ALL the interfacing to the television. It has:

2 sound registers

1 playfield

2 players

2 missiles

5 color registers (one background)

1 "extra" player collision register

line timing

2 A/D converters (for paddles)

In addition, the VCS comes with a RIOT (6532) chip with 128 bytes RAM, 2 pia type ports, and one timer. It also comes with a 6507 (seven) in a 28 pin package with 13 address lines (8k memory space) and NO interrupt lines, except chip reset of course!

Now, every program on the VCS has the same general flow:

Generate vertical sync, set timer for small amount of time. Do a limited amount of game logic — "attract mode" and the like. Generate rest of vertical blank interval and set timer for bigger chunk of time.

Do *all* the rest of the game logic

Clear Vblank, and start generating display.

The TV interface adapter has NO DMA capability, and the VCS has only 128 bytes of RAM for *everything*, so the program MUST generate EACH TV of display and stick it out on the fly. There are several registers corresponding to the playfield, 40 bits across, the players, 8 bits across and

the missiles, 2 bits across. Since this is extremely time-critical code, programmers often resort to weird tricks to do this. Among other things, the TV chip is memory mapped in BOTH page 0 AND page 1, so that stack and zero-page instructions can be used.

Atari calls the code that generates the actual display a "shell" for some obscure reason. It involves the program waiting for each line.

The VCS uses a 6507 which doesn't have interrupts, therefore, the lone timer of the RIOT must be used for everything, including frame timing.

The way color works is especially interesting. Rather than waste bits in the display data to indicate a limited number of colors, there are 4 "color registers" 2 nominally playfield and 2 nominally player/missile registers, and each can take a even value from 0 to 254. This allows 16 colors of 8 hues each. In order to select these colors, the computer just sets up these color registers somewhere along with some control information on exactly which color register goes to which playfield/player/missile and then writes out display data indication which of two color REGISTERS is in use.

One of the problems with a video game is "burn-in" — that is, if you leave one pattern on a TV screen for a long time, it tends to get burned in. Atari, after all, started out making arcade games, and naturally, this was a very serious problem for them. In order to alleviate this, they had to devise an "attract mode" (thought I wasn't going to explain it earlier, didn't you!) for each game, which would exercise all the phosphors in the screen equally. Since the VCS had the same problem, what they did in many games was after some amount of time had gone by, they would XOR the values to go into the color registers with some random number, set them to darker colors before storing them. Admittedly, this may not be "attractive" . . .

Now, the VCS was designed with 1976 technology (that is why Odessey and Intellivision have much nicer looking games) and so has a limited amount of RAM chips. It is designed exclusively for simple video games, as PONG, Tank, etc. where you have a small number of objects (players and missiles) moving around in a playfield. It's real easy to move a player — just move him around vertically by changing one hardware loc. — the delay across the screen line before it is displayed, and one RAM loc. for screen generation program logic — to put out real data at a different time down the screen.

This makes it real easy to move things around the screen, but brings another factor into play — you also have to be able to find out when they've collided. Since the hardware has to worry about this anyway when it decides what object to display, it also looks for these collisions, and sets bits to say so when they have. Then, in your vertical blanking code, you can just look at these bits and clear them. No messy compares or icky ORs!

Obviously, programming a game for the VCS is a real pain, but that is, or rather was, cheaper than the cost of extra hardware.

Now, the Atari 400/800 was designed by the same people, who obviously were sick and tired of programming the VCS, and decoded to put as much of the graphics "dumb-dumb" stuff into special hardware chips, freeing the processor for doing more interesting stuff.

The biggest hassle of the VCS was generating the display, therefore, a new "television interface CONTROLLER" was designed to do this. In essence, it does the work

continued

that the 6507 did in the VCS to generate the display, fetching stuff from memory and sticking it into the playfield shift registers. Since timing was such a hassle also in the VCS, an elaborate series of interrupt hardware was built into the 800. Now, the main routine doesn't need to worry about timing, an interrupt simply comes around at the proper time, and the interrupt routine does the fancy stuff.

The number of players and missiles was doubled. Now you can have 2 times as much stuff going on on the screen. Since this crowded the tv interface adaptor, the sound logic was moved off to another chip, which also controls the keyboard logic.

Since the FCC had a rather restrictive set of regulations on RFI, the Atari 400/800 case was designed to be as RFI-proof as possible. And this meant (for some reason) that they had to go to a slower serial bus for peripherals. They also devised a way for it to work with a cassette player, and left enough holes to potentially use it for RS232 communication.

But the fanciest part was the display list, because instead of drawing simple playfields for a game, presenting complicated text/graphics images is the name of the game.

There are several fundamental issues that come into play in designing a digital graphics device and they are:

1. Memory constraints — the finer the detail on the screen, the more memory they use
2. One often wants to display several types of data at once — i.e. a chart with an explanation underneath, etc.
3. If one wants to animate the screen, one needs to switch screens very rapidly, and preferably without moving more memory than one must.
4. If one is presenting text, it is nice to have several fonts.

The scheme that they used will satisfy all of the above requirements in a much more elegant way than any other personal micro has yet. Basically, ANTIC is ANOTHER MicroProcessor, with its own program, which tells it what to do. In essence, its program is like a chain of CCWs (channel control words) is for an IBM peripheral. It tells the device what to do, where the next instruction is, where the data is, etc. ANTIC's program is called the display list.

Most instructions specify one of 14 "display modes" and also certain control bits, one of which is "load the memory scan register with the next two bytes." The memory scan register points to the data that Antic will display.

A few special instructions include: Blank 1-7 lines, JMP and Jmp and wait for Vertical Blank.

In addition, all instructions have a "Display List Interrupt" (DLI) bit, which says to ANTIC "Ask the CPU for service at the end of this line" This is one way the 6502 can modify the screen in mid-air, such as changing colors, etc. Remember there are still a limited number of color registers, 9 instead of 5 in this case, but still not quite enough. Many games, including Breakout and Star Raiders use this bit.

In addition to this, there is also a "font" register which points to the current font for text information. Star Raiders changes this register to change fonts in the middle of the screen.

A simple display list might be:

```
DISLST •BYTE $70,$70,$70 ; blank the first 3*8 lines
      •BYTE $48           ; losest resolution graphics,
                          ; load memory scan pointer
                          ; also
      •WORD GRAMEM        ; where the data is
      •BYTE 8,8,8,8,8,8,8 ; 8 more logical lines
      •BYTE 8,8,8,8,8,8,8 ;
      •BYTE $42           ; text window, load memo-
                          ; ry scan

      •WORD TXTMEM
      •BYTE 2,2,2         ; 3 more lines
      •BYTE $41           ;
      jump and wait for
      vert. blank.
      •WORD DISLST
```

PLAYER/MISSILE DMA:

Like the VCS, the Atari 400/800 has the players and missiles, though more of them. But, Antic also handles them. Basically, you set aside a block of memory to store each player and the missiles and tell Antic where it is. To move them horizontally is just like the VCS, just change a pos. register to adjust the time across a video line. To move them vertically is harder. Each player cohists of 256 bytes (usually) of memory that covers 256 lines of 8 pixels each, as a vertical band down the screen. To move a player involves shoving this memory up or down. Missiles are even worse, being 2 bits wide, each video line of missiles is PACKED into ONE byte! To move them, you have to shove JUST those two bits up or down! But is is better than having to have the program stuff the playfield numbers into the registers. Actually, there is a vestige of the VCS in that you HAVE access to these shift registers (actually a buffer to them) and you can do player/missile I/O the hardway, just as the VCS does. It works great for rulers though, and Breakout uses several players for the boarders!

I referred to interrupts briefly earlier. In a more detail, there are many things that can ask for interupts, including:

- Keyboard
- Break key (seperate)
- Serial bus via PIA (unused by Atari)
- Sound timers
- Display list interrupts
- Vertical blanking
- "System Reset" — actually just generates a NonMaskableInterrupt
- Serial "ACIA" logic in POKEY
- (and maybe others that I can't remember)

It is quite possible to write a game where just about all the processing takes place in the interrupt routines and the main routine does, perhaps, nothing! I've written a FontEditor where all the Joy Stick and Display processing took place in the Vertical Blank routine (60 times a second) and the main routine spent most of its time asking the operating system for a user command, completely seperate from the joystick! I had a "TEST" command that would return me to Basic or whatever without killing the vert. blank routine so I could run a Basic program and the character changing routine at the same time.

BAKER STREET BYTES

April 1982

By RICHARD GIZYNSKI

When I was eight or nine, I loved secret messages. To keep my messages secret, I substituted a number for a letter. One was an A, two a B etc. If I had been born about a century or two earlier, I could claim that programmers took my 'secret code' and used it to create their various programming languages. Atari BASIC carries this 'secret code' one step further. Where I represented one letter with a number, Atari represents a whole word with a number. This is called tokenization. All of the commands and all of the variables that are stored by Atari Basic use this token system of storing information. That way, when the program calls for a variable, Atari has only to see a token saying 'the next item up is a variable', read a one byte number, look up its value, and then act upon it as called for by the program. Remember, the number up to 255 *can be* one byte in memory not three individual digits that we would use to write 255.

When a BASIC program is typed in, a separate table or list is kept of the name of each variable that is entered. Atari quickly checks the table to see if that name has already been used. If not, the name is added to the list. The variable will be known to the rest of the program by its order of appearance in the list of names. When a program is LISTed, Atari looks the name up and re-substitutes it for the token number that is used in the program. Long or short, variable names take only one byte of memory except in the variable name table. This also lets the BASIC program run much faster as only one byte number has to be read.

Once entered, a name is never eliminated from this table. If we change our mind about what to call a variable, the new name is added to the list but the old name remains. If a program is SAVED to cassette or disk, the variable name table is SAVED along with it. The only way to clean up this table and remove the old, no longer used names is to LIST the program to tape or disk and then ENTER the program. ENTERing a program has the same effect as typing it in. As the program is ENTERed, each variable is given a place in the name table as it appears and a new token number is put in its place in the program.

Location 130 and 131 (decimal) are used by Atari to contain the starting address and location 132 and 133 the ending address of the variable name table. Another table (location 134 and 135 decimal) is used to keep the value of simple numeric variables. DIMensioned variables are kept at the end of the program area. The number 128 is added to the last letter of a variable name Atari value and is used to tell BASIC that that is the last letter of the name. This last character will appear on the screen as a reverse character. Characters with numbers from 0 to 127 are reversed by adding 128 to them.

The following two programs list the variable names that have been used in your programs. The first, and shortest one, uses one variable WHERE. The second one is for those of you that have a printer. It will PRINT each variable name on a separate line. If you have used the 128 variables that Atari Basic allows, substitute any of the

numeric variables that are already being used in the program and use a string variable long enough to hold the longest variable name you have used. After entering this program, run it to test it then LIST "C:" (or "D:filename"). When you wish to check which variables have already been used in another program, ENTER "C:" (or "D:filename") then type in GOTO 32500.

Our first program begins by putting the start of the variable name list into a more convenient form. Line 32530 then checks to see if you have reached the end of the name list. Line 32540 PRINTS the character found there. Line 32560 checks to see if that is the last character of a name and, if so, prints a blank space to separate the names. Line 32570 increments the position that will be looked into and line 32580 recycles us to the check for end of table routine.

The second program line 32540 CLOSES the Input/Output Control Block that will be used to get a response to the keyboard. You get an error message if you try to OPEN an already open IOCB but closing one that is already closed causes no problems. Then I OPEN IOCB #2 for input from the keyboard. If the program you are checking was stopped by a stop command, this procedure will avoid error messages. If you have typed a 'Y', KEY will GET the ATASCII value for 'Y' (89) from the keyboard. Line 32570 closes the string variable WORD\$. Line 32580 checks to see if we are at the end of the name list and PRINTS an ending message if we are. Line 32590 adds the character that we are checking to the ones that are part of the current variable name. Line 32600 sends us back for another letter if the name is not complete.

Ⓜ

```
32500 REM VARIABLE NAME LISTER
32510 REM BY RICHARD GIZYNSKI
32520 DIM WORD$(20)
32530 PRINT "DO YOU WANT A HARDCOPY"
32540 CLOSE #2:OPEN #2,4,0,"K:"
32550 GET #2,KEY
32560 WHERE=PEEK(130)+256*PEEK(131)
32570 WORD$=""
32580 IF WHERE=PEEK(132)+256*PEEK(133)
THEN PRINT "--THAT'S ALL FOLKS":END
32590 WORD$(LEN(WORD$)+1)=
CHR$(PEEK(WHERE))
32600 IF PEEK(WHERE)<128 THEN
WHERE=WHERE+1:GOTO 32580
32610 PRINT WORD$;" ";
32620 IF KEY=89 THEN LPRINT WORD$
32630 WHERE=WHERE+1
32640 GOTO 32570
```

THE FAMILY COMPUTER CENTER

3947 W. Twelve Mile Road

Berkley, Michigan 48072

313/546-8114

M.A.C.E. MEMBERS

Heres what's new at

THE FAMILY COMPUTER CENTER

SERVICE CENTER

All Atari Service Center contracts nationwide were cancelled on March 15th. Each center had to reapply and pass credit, competency and operational audits to become one of Atari's new "Independent Service Centers". We are pleased to announce that our service center has successfully undergone this operational audit by Atari's aggressive, new field support group from Sunnyvale.

Also that John Blumm has been named Service Center Manager. John will be ably assisted by Andrew Keyes and Linda Brunner.

COMPETITION

Announcing a new sales policy to benefit M.A.C.E. members and to *encourage* your patronage. A two tiered price structure will henceforth be in place with Level A and Level B prices. Level A prices will entitle purchasers to full support privileges at The Family Computer Center. This includes free attendance at our extensive series of software overview courses beginning in April and running through the year. (Example, if you bought your Atari 400 elsewhere but have had no training you can buy your disk or printer from us at a Level A price and receive the same training privileges as computer customers receive.) Level B prices will be available to M.A.C.E. MEMBERS ONLY and will exclude our training and support programs (other than service which is available to everyone). Level B prices will be competitive with other "Limited Service" stores in the Detroit area.

Prices Effective Till May 15

Examples:

400

800

739

LEVEL A

\$369

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\$699

LEVEL B

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\$699

\$629

Word Processor Expansion Package

Atari Word Processor
Centronics 739
Atari 850 Interface

\$899

Large group of
Software 15 to
20% off with
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Pascal Expansion Package

Atari Pascal
Extra 810 Disk Drive

\$499

An Exciting New Service of The Doll Hospital & Toy Soldier Shop, Inc.

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POKES

BY ARLAN LEVITAN

OK Marshall, I hear you! I promise I'll keep it short this month! Besides, when I ramble on these days I have to bear in mind the fact that I might be putting over four-hundred people to sleep!

The West Cost Computer Faire held in San Fransico drew over 40,000 attendees. A company called Bit 3 introduced Full View 80 for the Atari 800. It provides a full 80 x 24 display while retaining the forty character text and graphics modes. Characters with full lowercase descenders are in a high-res 8 x 10 matrix. The board plugs into memory slot 3 and will support a new 80 column version of LJK's Letter Perfect Word Processor. No price as yet.

LJK showed off its new all machine code data base package, DATA PERFECT. Rob Gordon from Starfleet User Group in Denver is very enthusiastic about the product.

Several firms were brandishing double density disk drives for the Atari. Units from MPC and Percom will both require modifications to DOS. A very reliable source has Outpost Atari columnist David Small and his Texas cronies releasing a FAST, high density, DOS compatible drive in the near future.

MACE Vice President Jerry Aamodt's Crypto program graces the latest issue of Softside, along with a look at word processors for the Atari by the ubiquitous Sheldon Leemon, MACE's Secretary of Solid State. Congratulations gents, now if only they would send you two a complimentary issue ... talk about tight!

On the home front, MACE is compiling city oriented lists of MACE members so you can find out who to hang out over the back fence with in your area. If anyone would prefer that we not include their name and number, PLEASE CALL AND LET ME KNOW. I really hope I don't get very many calls. Communicating your experiences, knowledge, and questions to fellow users is one of the best ways to learn

more about your machine.

If we are to keep producing a newsletter of the quality you folks are getting used to, it's more important than ever for you to let our advertisers know you appreciate their support of MACE. Do you realize that this is the largest monthly all-Atari publication around? We print more Atari material on a yearly basis than Analog.

Speaking of Analog, I took umbrage at the editorial comments of Lee Pappas in the latest issue of his mag (you know, the adjective 'latest' seems oddly appropriate in this case...). According to Lee, it's not enough that MACE does not allow or encourage the dissemination of copyrighted programs at its meetings. If Mr. Pappas had his way, the club officers would be breaking down members doors in search of pirated software. Pappas's arguments concerning sector copy programs are not totally devoid of intelligence or merit (almost, but not quite)...perhaps we should eliminate option J of the DOS menu also because it encourages piracy?

Remember to bring your MACE ID to the May Birthday Party Meeting. Please don't bring friends or relatives not in your immediate family. It's going to be crowded enough without them! The program libraries will not be open so that your almost tireless, unpaid officers can enjoy the whole meeting for a change! See you there!

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TUTORIAL

CASSETTE I/O

Part 3: The INPUT and PRINT Instructions

by Tom Giese

The PRINT and INPUT instructions are used to write and read data files in ATASCII character format. When PRINTing out string variables, each character of the string requires one character in the file. When PRINTing numeric variables, digits of the number, the decimal point, and the sign, each require one character in the file. The format for a PRINT statement for output to a file is:

PRINT #iocb;variable-list

Where:

iocb - is the input-output control block.

variable-list - are the variables to be output.

When writing to a file with a PRINT statement, each data item written to the file should be followed by a carriage return character. The carriage return character for the ATARI computer is CHR\$(155). An easy way to insert this character into a print variable list is to initialize a string variable to the carriage return character.

The format for an INPUT statement for reading from a file is:

INPUT #iocb,variable-list

Where:

iocb - is the input-output control block.

variable-list - are the variables to be read.

When INPUTing variables in the variable list should be separated by commas. When PRINT and INPUT are used with a file, they exactly parallel their operation with the screen. In particular, file INPUT requires a carriage return character in the file between INPUT data items.

Here are some examples:

I. Write out the variables A, B, C, and D to a file and then read data back into the

variables.

Program 1: Write out the data.

```
10 DIM CR$(1):CR$=CHR$(155)
20 READ A,B,C,D
30 DATA 1,2,3,4
40 OPEN #1,8,0,"C:"
50 PRINT #1;A;CR$;B;CR$;C;CR$;D
60 CLOSE #1
```

Program 2: Read in the data.

```
10 OPEN #1,4,0,"C:"
20 INPUT #1,A,B,C,D
30 CLOSE #1
```

II. Write out an array into a file and then read the data back into the array.

Program 3: Write out the array.

```
10 READ ROWS,COLS
20 DATA 2,3
30 DIM ARRAY(ROWS-1,COLS-1)
40 FOR Y=0 TO COLS-1
50 FOR X=0 TO ROWS-1
60 READ A
70 ARRAY(X,Y)=A
80 NEXT X:NEXT Y
90 DATA 1,1,2,2,3,3
100 REM WRITE OUT THE ARRAY
110 OPEN #1,8,0,"C:"
120 FOR Y=0 TO COLS-1
130 FOR X=0 TO ROWS-1
140 PRINT #1;ARRAY(X,Y)
150 NEXT X:NEXT Y
160 CLOSE #1
```

Program 4: Read in the array.

```
10 READ ROWS,COLS
20 DATA 2,3
30 DIM ARRAY(ROWS-1,COLS-1)
40 OPEN #1,4,0,"C:"
50 FOR Y=0 TO COLS-1
60 FOR X=0 TO ROWS-1
70 INPUT #1,A
80 ARRAY(X,Y)=A
90 NEXT X:NEXT Y
100 CLOSE #1
```

GREAT MEMORY MYSTERIES PART I CONQUERING THE CHARACTER SET

by Eric Sobocinski

You may not know it, but every time you turn on your computer, you use the character set. The character set is a portion of memory which defines what each character on the screen looks like. So who cares? Normally, nobody does. The Atari character set is pretty comprehensive, so we usually just let it do its thing. Sometimes though we want something extra like script letters, block letters, or our own special graphics characters. To get these characters we must modify the character set.

Now don't run away and hide just yet. This is really kind of easy! The character set is normally located from 57344 to 58367 decimal (\$D000 to \$D3FF hex). This is a part of ROM (read-only memory), so we can't change it at all. What we can do is move the character set from ROM to RAM where we can change it. For now we will use the memory area from 14336 to 15360 decimal (\$3800 to \$3BFF hex). You might want to use the following program:

```
10 REM MOVES CHARACTER SET,
15 REM RUNS FOR 15 SECONDS.
18 REM
20 FOR L=0 TO 1023
30 POKE L+14336,PEEK(L+57344)
35 REM READS OLD SET, POKE IN NEW
38 REM LOCATION.
40 NEXT L
50 POKE 756,56
```

The POKE in line 50 is a pointer that tells your Atari to look at your new character set instead of the old one. Location 756 decimal (\$02F0 hex) holds the most significant byte of our new starting address. It is equal to our new address divided by 256 (For us: $14336/256=56$). Notice that 14336 is a multiple of 1024 ($14 \times 1024 + 14336$). Funny things happen if it isn't! If you're curious, try using a non-multiple sometime.

Now that we have the character set down in RAM, let's do something with it. Each character is made of eight lines of eight pixels (points) each. Each line is represented by one byte, and each pixel in the line is represented by one bit in the byte. To get the value of each byte we must determine the value of each bit, then convert from binary to decimal (or hex for assembler). If you don't know how, look for a forthcoming article in this newsletter. Each "1" is a pixel on; each "0" is a pixel off.

The following program prints any character as it appears in the character set in use:

```
10 REM PRINTS ENLARGED CHARACTERS.
20 PRINT CHR$(125);"TYPE A NEGATIVE
CODE TO STOP."
30 POKE 84,3:PRINT "INTERNAL
CODE";CHR$(254);CHR$(254)
35 INPUT C:IF C<0 THEN END
```

```
40 C=C*8+PEEK(756)*256;FOR L=1 TO
5:PRINT:NEXT L:PRINT "LOCATION"
50 FOR L=C TO C+7
60 PRINT L;" ";;P=PEEK(L)
70 FOR B=7 TO 0 STEP -1
80 IF P<2^B THEN PRINT CHR$(32);GOTO 100
90 PRINT CHR$(160);P=P-2^B
100 NEXT B
110 PRINT:NEXT L
120 GOTO 30
```

Characters are arranged in order of their internal code numbers, not ASCII numbers! The internal codes are listed on page 55 of your Atari Basic Reference Manual.

Now for the fun stuff. Run program A to initialize a new character set. do not press the system reset after this point, or you will have to start over. Run program B now. If you use "1" as your internal code, you will get an exclamation point identical to the screen version, only considerably larger. Enter any negative number to stop. Now let's POKE 14351,255 and return. This turns on all of the pixels in the bottom line of the exclamation point (255 decimal + 11111111 binary). Now run program B again and enter "1" as the code number. What you should get is an underlined exclamation point! Until you change the character again or press system reset, all exclamation points will be underlined. Surprise, surprise. By poking the appropriate values into the appropriate locations, you can change any characters into anything you want, or even create a totally new character set. It all depends on what you want to do.

Now that wasn't so bad, was it? Happy computing!

SUMMARY CONQUERING THE CHARACTER SET

The character set is a 1K section of memory which defines what each character looks like.

The ROM character set starting address is 57344 decimal. (\$5600 hex)

A RAM starting address can be any multiple of 1024 (\$0100 hex).

THE MSB of the character set starting address is poked into location 756 decimal (\$02F0 hex).

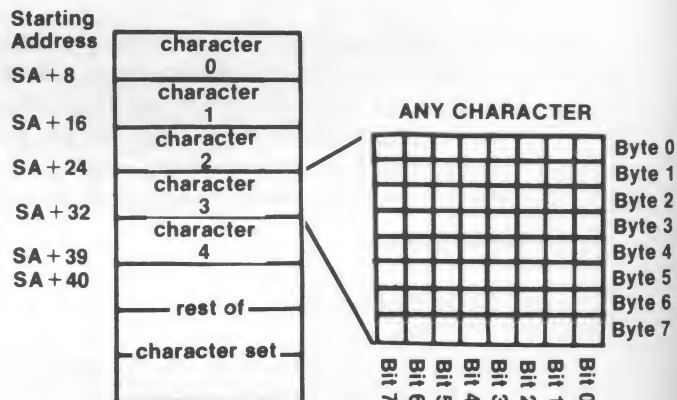
Characters are arranged in order of internal code numbers, found on page 55 of your Atari Basic Reference Manual.

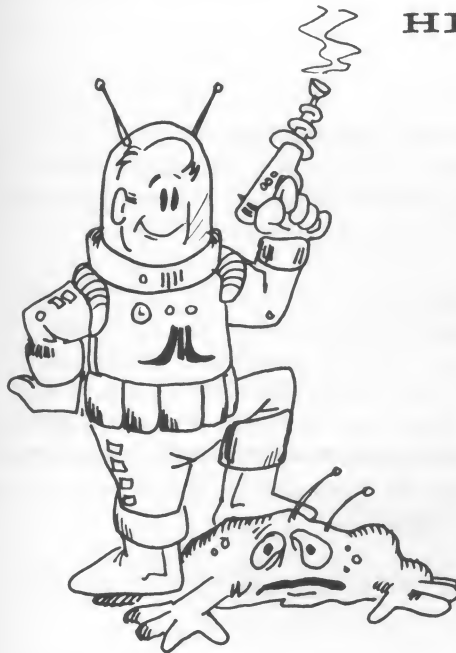
Each character is defined by eight bytes.

Each byte represents one line of a character.

Each line of a character contains eight pixels (dots).

Each pixel is represented by one bit.





HIGH SCORES

MISSILE COMMAND:

1,593,950 - James Hetzel

1,004,165 - Dirk Hoag

JAWBREAKER:

34,000 - Richard Gizynski Jr.

SHADOW HAWK I:

Starlord - Richard Gizynski Jr and senior.

ASTEROIDS:

1,000,000 - Richard Gizynski Sr.

(With 20 ships left before his wife made him quit!)

**KEEP THOSE SCORES
COMMING IN!**

UNCLASSIFIED ADS

MICROLINE 80 PRINTER

80 COL. , Expanded or condensed type, graphics. Outstanding condition. \$275. Marshall Dubin 338-3488 after 6 p.m.

USED SOFTWARE

Mailing List — \$10, Startrek 3.5 — \$8, Preschool Games — \$5.00, Sebrees Text Editor — \$5.00. Marshall Dubin, 338-3488 after 6.

820 PRINTER RIBBONS

NEW black Atari 820 Printer ribbons 3.50 each. Richard Gizynski 435-6026 after 5 P.M.

8K MEMORY

Call Marshall Dubin

1982 MEETING SCHEDULE

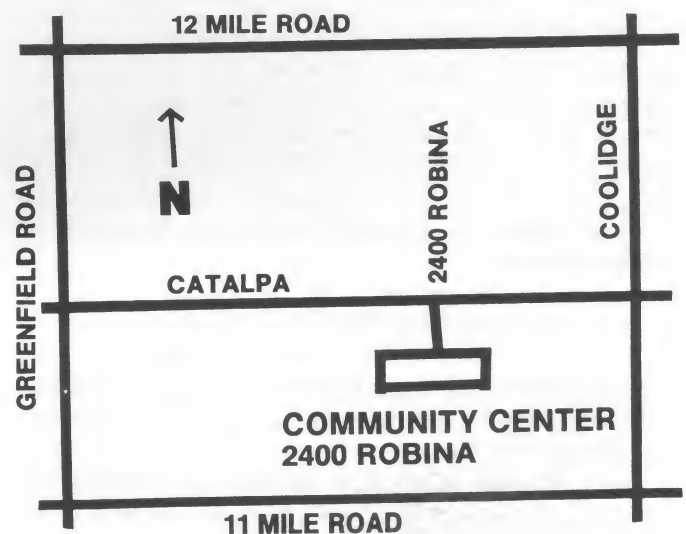
APRIL 15
MAY 20
JUNE 17

SEPTEMBER 16
OCTOBER 21
NOVEMBER 18
DECEMBER 16

S.I.G. GROUPS

Educational SIG:

The next meeting is set for Thursday, April 22, 7:30 at the home of Jim and Cindy Rice in Rochester. Call 375-9821 for more information.



HERE'S TWO FOR THE KIDS BY JERRY AAMODT!

COLORFORM

By Jerry Aamodt

I'm sure some of you out there that have the same problem in your house that I have in mine. That problem is a pre-schooler who can only sit and watch his older brother play computer games. The problem I've had to cope with is how to minimize the keyboard operations while not limiting creativity.

In the following program, I tied subroutines to single keys which allow drawing, plotting, filling without the necessity of having to use program statements. This program requires instruction and assistance to set up for the very young, but you will be amazed how quickly they learn to use the mechanics.

The commands in this program are "D" for draw, "B" for blocks, and "P" for paint. The numbers 1,2, and 3 are used for each of the three colors to be used. I've added "T" and "F" to give you some idea of special effects which can be introduced. To move the curser, we use the four "arrows" on the keyboard. To draw a line move the curser to the starting point. When we're at the desired location, enter a color, a 1,2, or 3. A color spot will be placed at that location and the curser will return to the corner. Move the curser to second location an enter "D", the computer does the drawing. You can continue drawing with the same color by moving to a new location and hitting "D" again.

When you wish to change colors just enter one of the numbers instead of a letter. The "B" or block works much the same way, except when "B" is pressed the computer will draw a block with the two points being diagonal corners. "P" or "paint" is nothing more than the standard "fill" routine found on page 54 of your manual.

For my own pre-schooler, I created a couple of "starter" pictures saved on disk, which I can put on the screen to get him started, though mostly he just starts with a blank screen. Sheldon has promised he will do a super screen dump and recall program that beats my own, so I haven't included one in this program.

You could also add a subroutine that allows you to select the colors to be used. One last command and you can begin. If the picture gets too cluttered, hit the "clear" button and it will erase the screen. I've found two "problems" with my youngster. Because of the proximity of the "caps" key and the "inverse video" key, you may find the youngster pushing them by accident while moving the curser whereupon your curser will not move. You can correct this by changing the code so the coputer recognizes the inverse or small characters if you so desire, or you can correct it on the keyboard when it happens.

```

95 DIM E$(10):OPEN #2,4,0,"K":GRAPHICS
5
100 X=0:Y=0
101 REM We'll start by initializing our
x and y coordinates.
105 COLOR 1:PLOT X,Y:OLDX=X:OLDY=Y:GET #
2,G
106 REM Now now we PLOT the x and y coor
dinates in the upper left corner.
107 REM This could have been plotted any
where, but I found this doesn't interfer
e with the picture as much.
108 REM With the GET command we alert th
e computer to look for a key to be press
ed.
110 IF G=49 OR G=50 OR G=51 THEN 180
115 IF G=68 THEN 200
120 IF G=80 THEN 220
125 IF G=84 THEN 250
130 IF G=70 THEN 260
135 IF G=66 THEN 270
145 IF G=60 THEN ? #6;"":GOTO 100
155 IF G=45 THEN Y=Y-1:IF Y<0 THEN Y=40:
GOTO 125
160 IF G=61 THEN Y=Y+1:IF Y>40 THEN Y=0:
GOTO 125
165 IF G=42 THEN X=X+1:IF X>79 THEN X=0:
GOTO 125
170 IF G=43 THEN X=X-1:IF X<0 THEN X=79:
GOTO 125
175 COLOR 0:PLOT OLDX,OLDY:GOTO 105
180 M=G
185 COLOR M:PLOT X,Y:PX=X:PY=Y:GOTO 100
200 COLOR M:PLOT PX,PY:DRAWTO X,Y:PX=X:P
Y=Y:GOTO 100
220 COLOR M:PLOT PX,PY:POSITION X,Y:POKE
765,M:XIO 18,#6,12,0,"S:"
225 PX=X:PY=Y:X=0:Y=0:GOTO 105

```

continued

```

250 GOSUB 600:RESTORE 1000:FOR I=1 TO 12
:READ B,E$:POSITION X-B,Y-I: ? #6:E$:NEXT
I:GOTO 100
260 GOSUB 600:RESTORE 1001:FOR I=0 TO 6:
READ B,E$:POSITION X-B,Y-I: ? #6:E$:NEXT
I:GOTO 100
270 COLOR M:FOR I=0 TO ABS(Y-PY):IF Y>PY
THEN PLOT PX,PY+I:DRAWTO X,PY+I:NEXT I:
GOTO 100
275 PLOT X,Y+I:DRAWTO PX,Y+I:NEXT I:GOTO
100

```

```

600 IF X>72 THEN X=72
605 IF X<6 THEN X=6
610 IF Y<12 THEN Y=12
615 RETURN
1000 DATA 0,A,0,A,0,A,1,BBB,3,BBBBBBBB,4,
BB BBB BB,5,BBBBBDDBBBB,4,BBDBBBBBBBB,3,
BBBB BBB,2,BBDBBB,1,BBB,0,B
1001 DATA 0,2,0,22,1,22 2,2,2 2,0,3,1,3
3,0,3

```

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CONCENTRATION FOR PRE-SCHOOLERS

By Jerry Aamodt

The game is played by one or two players using joysticks in position 0 and 1. You will be asked if you wish to play against the computer(1 player game).

Enter the names of the player and opponent. Move the marker block using the joystick to the square you wish to see and press the trigger. Move the marker to the second square and press trigger again. If a match occurs, the same player plays again. If no match occurs then the second player or the computer plays.

The play field will be randomly reset after each game. Each time there are 10 sets of 4 each set. This program requires 16K with disk.

```

95 GOSUB 8000
100 OLDX=10:OLDY=8:NX=10:NY=8:COUNT=0:X=
1:Y=1:POKE 77,0:XS=1:YS=1
110 COLOR 1:PLOT NX-1,NY-1:DRAWTO NX+1,N
Y-1:DRAWTO NX+1,NY+1:DRAWTO NX-1,NY+1:DR
AWTO NX-1,NY-1
115 POKE 656,2:POKE 657,1: ? NM1$:POKE 65
6,2:POKE 657,25: ? NM2$:POKE 752,1
120 POKE 656,2:POKE 657,12: ? SC(0):POKE
656,2:POKE 657,37: ? SC(1):IF PL=1 AND CO
=1 THEN 1100
200 S=STICK(PL):IF A(X,Y)=0 THEN 210
203 LOCATE OLDX,OLDY,Z:IF Z<>0 THEN 210
205 IF STRIG(PL)<X>1 THEN COUNT=COUNT+1:G
OSUB 400:X=OLDX:Y=OLDY:GOSUB 600:GOTO 24
5

```

```

210 IF S=15 THEN 200
220 GOSUB 500+S
245 IF COUNT=2 AND PL=0 THEN PL=1:GOTO 1
00
250 IF COUNT=2 AND PL=1 THEN PL=0:GOTO 1
00
260 IF COUNT>2 THEN 100
299 GOTO 200
400 RESTORE 800:FOR K=1 TO A(X,Y):READ L
IN,REPS,MULT:NEXT K:RETURN
505 X=X+1:Y=Y+1:GOTO 540
506 X=X+1:Y=Y-1:GOTO 540
507 X=X+1:GOTO 540
509 Y=Y+1:X=X-1:GOTO 540
510 Y=Y-1:X=X-1:GOTO 540
511 X=X-1:GOTO 540
513 Y=Y+1:GOTO 540
514 Y=Y-1
540 IF X>8 THEN X=8
545 IF X<1 THEN X=1
550 IF Y>5 THEN Y=5
555 IF Y<1 THEN Y=1
560 NX=(20XX)-10:NY=(16XY)-8:XS=X:YS=Y
561 COLOR 0:PLOT OLDX-1,OLDY-1:DRAWTO OL
DX+1,OLDY-1:DRAWTO OLDX+1,OLDY+1
562 DRAWTO OLDX-1,OLDY+1:DRAWTO OLDX-1,0
LDY-1
565 COLOR 1:PLOT NX-1,NY-1:DRAWTO NX+1,N
Y-1:DRAWTO NX+1,NY+1:DRAWTO NX-1,NY+1:DR
AWTO NX-1,NY-1
570 OLDX=NX:OLDY=NY:RETURN
600 RESTORE LIN:COLOR 1:FOR J1=1 TO REPS
:READ X1,Y1,X2,Y2:PLOT X+X1,Y+Y1:DRAWTO
X+X2,Y+Y2:NEXT J1
605 COLOR 2:FOR J1=1 TO MULT:READ X1,Y1,
X2,Y2:PLOT X+X1,Y+Y1:DRAWTO X+X2,Y+Y2:NE
XT J1:X=XS:Y=YS:COLOR 1
675 C(COUNT,1)=X:C(COUNT,2)=Y:IF COUNT=1
THEN RETURN
680 IF A(C(1,1),C(1,2))=A(C(2,1),C(2,2))
THEN SC(PL)=SC(PL)+1:GOTO 700
685 FOR J=1 TO 2:FOR I=1 TO 15:POSITION
(20XC(J,1))-19,(16XC(J,2))-1: ? #6: "
":NEXT I:NEXT J

```

continued

```

690 RETURN
700 A(C(1,1),C(1,2))=0:A(C(2,1),C(2,2))=
0:SC(PL)=SC(PL)+1:IF PL=1 THEN 720
710 FOR J=1 TO 2:FOR I=1 TO 15:POSITION
(20*C(J,1))-19,(16*C(J,2))-I:? #6;"11111
111111111111111":NEXT I:NEXT J
715 GOTO 725
720 FOR J=1 TO 2:FOR I=1 TO 15:POSITION
(20*C(J,1))-19,(16*C(J,2))-I:? #6;"33333
333333333333333":NEXT I:NEXT J
725 TOT=TOT+2:IF TOT=40 THEN 9500
730 COUNT=3:RETURN
800 DATA 6010,3,2,6020,4,8,6030,4,10,604
0,12,2,6050,6,5,6060,6,5,6070,7,6,6080,1
0,7,6090,11,3,6100,3,9
1100 X=INT(8*RND(0)+1):Y=INT(5*RND(0)+1)
:IF A(X,Y)=0 THEN 1100
1105 IF X=C(1,1) AND Y=C(1,2) THEN 1100
1110 COUNT=COUNT+1:GOSUB 400:XS=X:YS=Y:X
=(X*20)-10:Y=(Y*16)-8:GOSUB 600
1185 IF COUNT>2 THEN 100
1190 IF COUNT=2 THEN PL=0:GOTO 100
1195 GOTO 1100
6010 DATA -4,-2,4,-2,-4,-1,4,-1,-6,2,6,2
,-4,0,4,0,-4,1,4,1,HAT
6020 DATA -5,0,5,0,-5,-1,5,-1,-4,2,4,2,-
4,-3,4,-3,-4,1,4,1,-4,-2,4,-2,0,-6,0,-6,
0,5,0,5,-3,-4,3,-4
6021 DATA -3,3,3,3,-2,4,2,4,-2,-5,2,-5,B
ALL
6030 DATA -6,4,8,4,4,3,7,3,5,2,6,2,6,1,6
,1,-4,3,-4,-1,-3,3,-3,-2,-2,0,-2,-3,-1,0
,-1,-4,0,3,0,-5
6031 DATA 1,3,1,-4,2,3,2,3,2,0,2,-3,3,3,
3,-4,4,2,4,-1,HOUSE
6040 DATA -2,-6,-2,3,-1,-5,-1,3,0,-5,2,-
3,1,-5,2,-4,0,2,3,5,0,3,2,5,1,5,2,3,-4,5
,-3,4,0,-2,3,0,0,0,0,-3
6041 DATA 1,-3,1,-3,-3,-6,-3,-6,-2,-2,0,
-2,3,-4,3,-4,DOG
6050 DATA -1,-4,-1,5,1,-4,1,5,-2,-3,-2,3
,2,-3,2,3,-3,-2,-3,1,3,-2,3,1,0,-5,0,7,-
4,-1,4,-1,3,3,3,3
6051 DATA 4,5,4,5,6,7,6,7,KITE
6060 DATA -7,0,-5,0,-3,0,-1,0,0,0,1,0,3,
0,7,0,-6,1,6,1,-5,2,5,2
6061 DATA -5,-1,5,-1,-3,-2,-2,-2,-3,-3,-
2,-3,1,-2,2,-2,1,-3,2,-3,BOAT
6070 DATA -3,0,-3,1,-2,0,-2,3,-1,0,-1,5,
0,0,0,7,1,0,1,5,2,0,2,3,3,0,3,1
6071 DATA -3,-1,3,-1,-4,-2,4,-2,-3,-3,4,
-3,-3,-4,3,-4,-2,-5,2,-5,-1,-6,-1,-6,1,-
6,1,-6,ICECREAM
6080 DATA -5,-3,-5,-2,-5,2,-5,3,-4,-2,-4
,-1,-4,1,-4,2,0,-2,3,-2,-3,-1,2,-1,4,-1,
4,-1

```

```

6081 DATA -3,0,5,0,-3,1,3,1,0,2,4,2
6082 DATA -6,-4,-6,-2,-5,-1,-5,-1,-5,1,-
5,1,-6,2,-6,4,0,-3,2,-3,-1,-2,-1,-2,-1,2
,-1,2,FISH
6090 DATA 3,-3,5,-3,-5,-2,-3,-2,3,-2,4,-
2,6,-2,6,2,-4,-1,-4,3,-3,-1,-3,3,-2,1,1,
1
6091 DATA 3,-1,5,-1,3,0,3,3,2,1,2,3,-6,-
1,-6,-1,-2,-2,2,-2,-2,-1,2,-1,-2,0,2,0,E
LEPHANT
6100 DATA 0,-2,-2,0,-1,0,-1,3,1,0,0,1,-4
,-2,-3,-3,-3,-1,-2,-2
6101 DATA 0,-4,1,-5,1,-3,2,-4,2,-1,3,-2,
3,0,4,-1,-3,4,1,4,-2,5,0,5,-2,6,0,6,FLOW
ERS
8000 DIM A(8,5),B(10),C(2,2),NM1$(10),NM
2$(10),SC(2),A$(1):PL=0:SC(1)=0:SC(2)=0
8005 ? "YOU WISH TO PLAY AGAINST THE COM
PUTOR":? "(Y/N)":INPUT A$:IF A$="Y" THEN
CO=1
8010 ? "ENTER NAME OF FIRST PLAYER":INP
UT NM1$:IF CO=1 THEN NM2$="ATARI":GOTO 8
020
8015 ? "ENTER NAME OF SECOND PLAYER":IN
PUT NM2$
8020 FOR I=1 TO 10:B(I)=0:NEXT I:FOR I=1
TO 8:FOR J=1 TO 5:A(I,J)=0:NEXT J:NEXT
I
8025 FOR I=1 TO 8:FOR J=1 TO 5
8030 A=INT(10*RND(0)+1):SOUND 0,10*A,10,
10:B(A)=B(A)+1:IF B(A)>4 THEN B(A)=4:GOT
O 8030
8040 A(I,J)=A:NEXT J:NEXT I:SOUND 0,0,0,
0
8045 RESTORE 8200:GRAPHICS 7:COLOR 1:FOR
I=1 TO 15:READ X1,Y1,X2,Y2:PLOT X1,Y1:D
RAWTO X2,Y2:NEXT I
8050 SETCOLOR 1,INT(15*RND(0)+1),6:TOT=0
:RETURN
8200 DATA 0,0,159,0,0,16,159,16,0,32,159
,32,0,48,159,48,0,64,159,64,0,0,1,0
8205 DATA 0,0,0,79,20,0,20,79,40,0,40,79
,60,0,60,79,80,0,80,79,100,0,100,79,120,
0,120,79
8210 DATA 140,0,140,79,159,0,159,79
9500 GRAPHICS 0:? "DO YOU WISH TO CONTIN
UE":INPUT A$:IF A$="N" THEN END
9505 ? "DO YOU WISH TO KEEP YOUR SCORE":
INPUT A$:IF A$="N" THEN RUN
9510 GOSUB 8020:GOTO 100

```

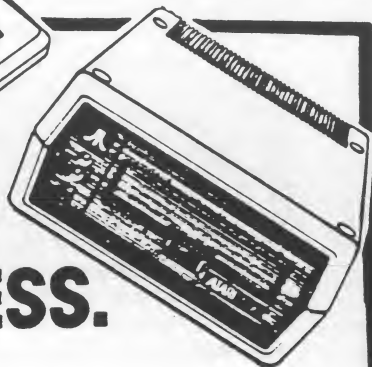
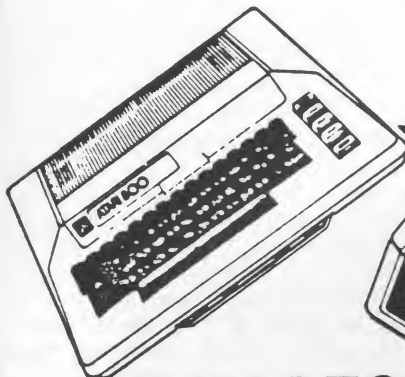


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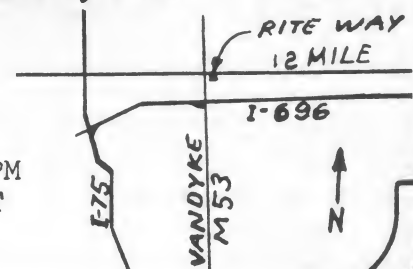
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INTERFACING YOUR ATARI TO THE REAL WORLD

By Marshall Dubin

Part One: Basic Input

With the addition of a few parts and some external circuits, your Atari personal computer can send and receive signals from the "real world." These signals can be the monitoring of alarms, thermostats, and a variety of digital and analog sources which in turn can control various motors, appliances, lights, etc. The purpose of this article is to discuss a method in which we can monitor up to four input signals from external sources in the real world.

For our purposes we will be using the joystick ports which are located on the front panel of the computer. Figure one shows a pin connection diagram of a single port. All four ports share this connection pattern.

Note that there are four pins labeled PIA. These pins are connected directly to the internal PERIPHERAL INTERFACE ADAPTER CHIP OF THE COMPUTER. The pins may be formatted for either input or output. We shall discuss them in more detail in future articles. Additional pins are the trigger pin for the joystick trigger buttons, two analog input pins, used for the paddle controllers, a +5v pin and a system ground pin. In this example we shall use the TRIGGER pins. Because there are four ports, each port may control a different device connected to the trigger pin of that port.

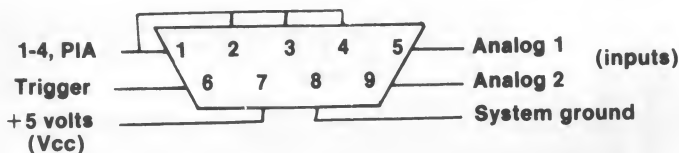


Figure 1: Pin Connections

Basic Input Using the Trigger Pin

When the computer is first switched on, the trigger pins are at a logic 1 (high) state. This is the DEFAULT status of these pins. The normal procedure when using joysticks is to have the computer react if the pin reads LOW (logic 0). When this is the case, the trigger is assumed to have been pressed. The following listing illustrates this point:

```
10 X=STRIG(0)    for port one
20 IF X=0 THEN PRINT "TRIGGER IS ACTIVE"
30 PRINT "TRIGGER IS NOT ACTIVE"
40 GOTO 20
```

The computer will take one action when the trigger is pressed and do something else when it is not. Any game using joysticks illustrates this point. Now what if an alarm sensor, liquid level sensor, or light activated switch were connected to the joystick trigger input? Ah-ha. We begin to see that the old joystick port can do more than blow away Zylons!

The Basic Input Connection

As I mentioned earlier, the default status of the trigger pin is a logic one. To simulate pressing the trigger button, we must make the status of that pin a logic zero. This is done by connecting that pin to system ground. When we do that, the pin is said to have been "pulled low," and will now read a zero.

The easiest way to do this is by connecting pin 6 of the controller port to pin 8 of the same port. In real world situations though, especially if the switch is not located right next to the computer, and especially if you are monitoring something more than a TTL level signal, this is best accomplished through the use of an external relay or better still an OPTO-ISOLATOR. Lets look at opto-isolators first.

An opto-isolator is composed of a LED (light emitting diode) and a phototransistor. When voltage is applied to the diode, it glows. The light emitted from the diode reacts with the photo sensitive transistor and "biases" it into conduction. Here the transistor acts as a switch which is turned on by the light from the diode, and off when the diode is dark. Since power need only be given to the diode, there is no chance that a higher damaging voltage can cross the optical barrier and damage the computer. As illustrated in figure two, when the transistor switch is ON, pin 6 of the controller port is connected to pin 8 (ground) thereby pulling it low, and simulating a trigger press.

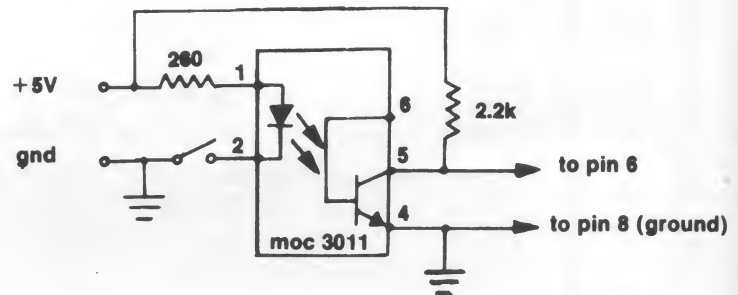


FIGURE 2: Using an opto-isolator

On this example, a relay is powered on by a high voltage such as 110 volts, and this causes the contacts to pull pin 6 low.

Do not try to power the opto-isolator from the "on board" 5 volt supply. It can only withstand 40 or so milliamps, and has other uses. Also note that the diodes in some opto-isolators can draw as much as 100 milliamps current, so you will need a supply capable of driving at least one or more of them. In addition, you may have to use a current limiting resistor between the opto-isolator supply and the LED, especially if you use higher voltages to drive the isolator. Use Ohm's law to figure the resistance you will need for the voltage and current ratings you will be using, if they are different from mine.

Figure three shows a method of using a relay to pull the trigger pin low. Figure four shows a light activated sensor (Sargent and Shoemaker, 1981) which will also work well.

Programming Considerations

Basically, the sensors can be used in a program in pretty much the same way as the joystick trigger buttons. The keyword STRIG will read the status of this pin as it does for the normal use of the joystick. Please note that the PTRIG keyword does NOT access pin 6 of the controller port, but uses different pins. You must use the STRIG keyword, or

continued

else PEEK locations 644, 645, 646 or 647 (decimal) to read the pin status. Each location is for a different port. 644 is port one, etc. Much the same as STRIG (0).

So Now What?

Go to it! Your computer can read and react to all kinds of neat things beside Zylons or Space Invaders. Try using a light beam sensor as a counter, or determining how many times your furnace motor kicks on during the day, or reacting to a metallic "end of tape" sensor for programable slide shows, or even bio-feedback (be SURE to use optical isolation)! What it boils down to is your imagination. Experiment! Learn! Enjoy!

In future articles I will be discussing output as well as the unique built in facility of the ATARI to accept analog input without the need for complicated external circuitry. I might also suggest a very good kit made by MOSAIC ELECTRONICS FOR THE ATARI which includes two DB9S plugs, ribbon cable, and instructions for using them for interfacing. The kit is about \$15.00 and is a good basic tool for the experimenters bench. Write to them at PO Box 748, Oregon City, Oregon 97045.

References

Sargent, M and Shoemaker, R, *Interfacing Microcomputers to The Real World*, Addison-Wesley Publishing Company, Reading, Massachusetts, 1981

Mosaic Electronics Atari I/O Package, Mosaic Electronics, P.O. Box 748, Oregon City, Oregon 97045

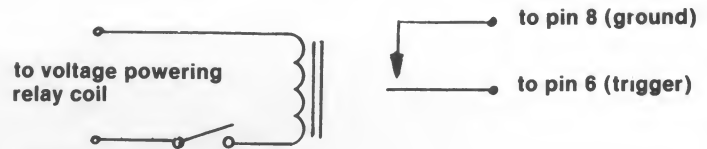


Figure 3: Use of a relay

When switch is closed, a signal is passed to the computer. Switch can be part of a relay if you wish to monitor high current devices. Have your device trigger a relay, which in turn will turn on the opto-isolator.

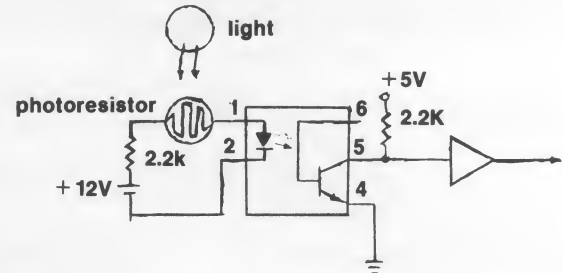


FIGURE 4

The on/off status of a light can be monitored by using a photoresistor as the LED's current limiting resistor. If the photo-resistor circuit uses more than five volts, an extra current limiting resistor may be needed (LED current shouldn't exceed 30 ma).

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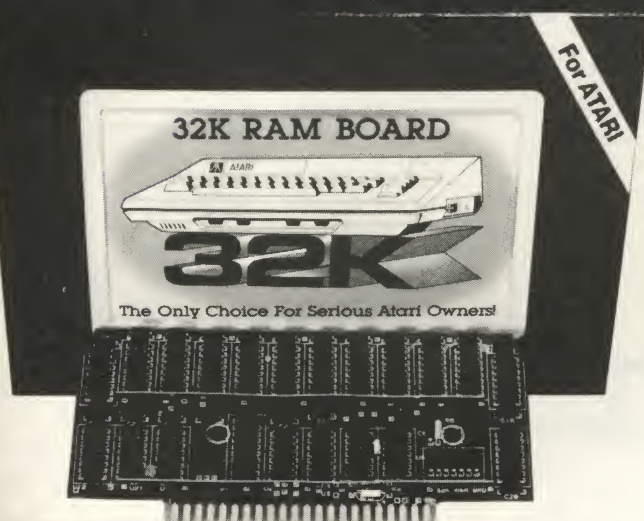
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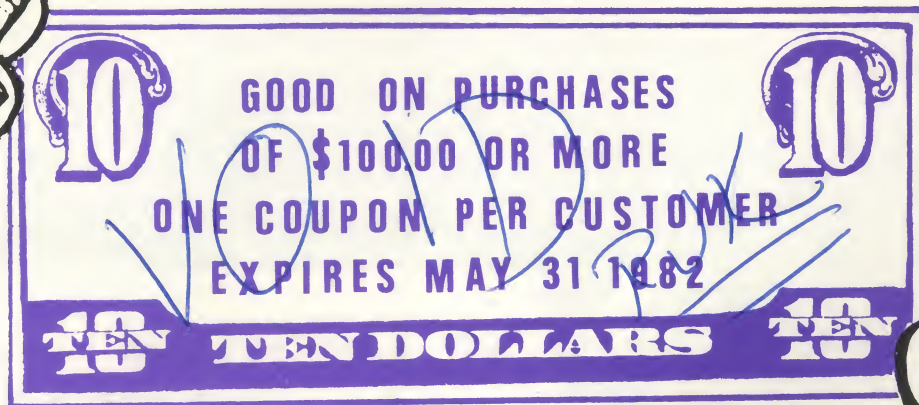
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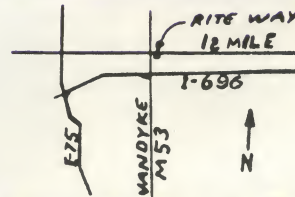
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